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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/815,082

03/31/2004

Alexander L. Gacta

SP03-046

7341

22928

7590

10/05/2007

CORNING INCORPORATED

SP-TI-3-1

CORNING, NY 14831

EXAMINER

DUPUIS, DEREK L

ART UNIT

PAPER NUMBER

2883

MAIL DATE

DELIVERY MODE

10/05/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/815,082

Applicant(s)

GAETA ET AL.

Examiner

Derek L. Dupuis

Art Unit

2883

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 12-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 12-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 3/31/2004 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/10/2007 has been entered.

Response to Arguments

2. Applicant's arguments filed 9/10/2007 have been fully considered but they are not persuasive.

3. In page 5, applicant argues that Kawanishi et al do not disclose a band gap structure with non-circular holes. The examiner respectfully disagrees. Kawanishi et al teach that the band gap grating shape "is not limited to columnar (circular hole), but may be of a triangular pillar (triangular hole), square pillar (square hole), hexagonal pillar (hexagonal hole), or the like." See column 5, line 65 to column 6, line 2. Triangular holes, square holes, and hexagonal holes are all examples of "non-circular" holes.

4. In pages 5-9, applicant argues that Kawanishi et al do not disclose a optical energy being guided "in a mode having a nonlinear refractive index of less than about 10^{-18} cm²/W. The examiner disagrees. Applicant then provides mathematical calculations showing that the overall nonlinear refractive index of the fiber cladding is outside of this range. As stated in applicant's own specification, light does not propagate in a photonic band gap structure. In the case of Kawanishi et al, the band gap structure is present in the cladding of the fiber. A defect is

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introduced in the core region by way of a hollow core filled with air. As explained throughout Kawanishi et al, light is propagated through the core. Therefore, it is the nonlinear refractive index of the core (not the cladding as argued by applicant) that is relevant since this is where the optical energy is guided. The nonlinear refractive index of air is $2.9 \times 10^{-19} \text{ cm}^2/\text{W}$.

5. In pages 9-12 applicant argues that the fiber of Kawanishi would not be capable of supporting a temporal soliton having a peak power of greater than about 1 MW. The examiner respectfully disagrees. The limitation of "being configured to support a temporal soliton having a peak power of greater than about 1 MW" is entirely a functional limitation. Only structural limitations have weight in a product claim. Therefore, to understand the patentable scope of a functional limitation, one must ascertain what structural qualities are required to perform or meet this functional limitation. Applicant's specification does not point out what structural features result in this improved functionality; but instead broadly state that the fiber having a PBG cladding region and a hollow air core surrounded by the PBG cladding is capable of performing such a function. Applicant's arguments provide additional details of what structural properties are necessary to meet the functional limitation. Specifically, applicant argues that the claimed invention has a nonlinearity that results in self-phase modulation to cancel the group velocity dispersion so as to balance the pulse spreading giving rise to solitons as claimed by applicant.

6. The examiner believes that the Kawanishi reference meets these structural elements and would be capable of performing the same function. Specifically, Kawanishi et al disclose an optical fiber with a hollow, gas-filled core (1). The cladding (2) surrounds the core and comprises a PBG. Light is guided through the core having a nonlinear refractive index within the cited range of less than about $10^{-18} \text{ cm}^2/\text{W}$. As argued by applicant in page 12, this nonlinear

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refractive index results in self phase modulation to cancel the GVD to balance pulse spreading and to give rise to soliton transmission.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-10 and 12-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over ***Kawanishi et al (US 6,404,966 B1)***.

9. Kawanishi et al teach an optical fiber for the transmission of optical energy comprising a cladding region (2) including a photonic band gap structure, the optical energy having a wavelength within the photonic band gap structure. The fiber also includes a core region (1) surrounded by the photonic band gap structure. The photonic band gap structure guides the optical energy substantially within the core region with a loss of about 0.01 dB/km which is less than the claimed ranges of less than 300 dB/km, less than 200 dB/km, less than 50 dB/km, and less than 20 dB/km (see column 3, lines 25-43).

10. Kawanishi et al also teach that the optical fiber includes a hollow core filled with air, which is a gaseous material (see column 3, lines 25-35). Light is guided within the air core; air has a nonlinear refractive index of $2.9 \times 10^{-19} \text{ cm}^2/\text{W}$ which is within the claimed range. The fiber is manufactured using a stack and draw method (see column 6, lines 34-42). Figure 3 also shows that the core has a diameter that is less than 4 times the pitch of the band gap structure. The core has a lower effective refractive index than the refractive index of the cladding band gap

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structure (see claim 1 of the reference). Kawanishi et al also teach multi-mode transmission (see column 3, line 66 to column 4, line 4).

11. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP 2144.05.

12. Kawanishi et al also teach that the optical fiber can be used to transmit pulses (see column 1, lines 60-63). As discussed above, the low non-linear refractive index results in minimal pulse spreading. Therefore, the pulse will retain its shape. Pulses such as these are solitons. One of ordinary skill in the art recognizes the benefit and desirability of high power signals. It would have been obvious to one of ordinary skill in the art at the time of invention to use an optical soliton pulse having a peak power of 3 MW since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

13. The claimed limitations citing the desired wavelength of the optical energy do not have patentable weight since these limitations merely specify what type of signal applicant intends to transmit via the claimed product. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham, 2 USPQ 2d 1647 (1987).

14. Regarding the limitation of a dispersion of greater than 20 ps/nm/km, applicant has recognized that the arrangement, spacings, and sizes of the holes in a microstructured fiber may

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be designed to yield microstructured fibers with dispersion ranging anywhere from large negative values to large positive values. Applicant recognizes that one of ordinary skill in the art would be capable of altering these structural details to achieve a desired design. See paragraphs 5, 33, and 34. Since it is within the level of one of ordinary skill in the art to modify the structure to achieve a dispersion value for a fiber, it would have been obvious to one of ordinary skill in the art at the time of invention to design the fiber to have a dispersion of greater than 20 ps/nm/km since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek L. Dupuis whose telephone number is (571) 272-3101. The examiner can normally be reached on Monday - Thursday 8:30am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Derek L. Dupuis
Group Art Unit 2883



Frank G. Font
Supervisory Patent Examiner
Technology Center 2800